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ABSTRACT

For education to respond to the new technologies that offer tools for mind expansion, the concept of information itself must be redefined. Instruction via electronic sources is a very different way of learning than instruction by print: electronic instruction is highly interactive, under the user's control, and full of imagery. Imagery is the language of the information age, and students should be trained to decode images and comprehend them. The basic skills needed for the information age will include the ability to evaluate the quality of information, and the ability to comprehend imagery. If schools do not reconceptualize themselves as institutions that are being transformed by the information technologies, they will lose their position as the major educators within our society and their place will be usurped by museums, libraries, shopping centers, and offices. Schools need to educate as though the technological revolution were the most important change in learning since the printing press, which indeed it may be. (JB)

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AN EDUCATED VIEW OF TECHNOLOGY

by

Mary Alice White

Address to the
Board of Regents of New York State
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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

The information age has arrived. The era of electronic learning has arrived.

We live now in a world of computers, of robots, of VCR's, of laser discs, optical fiber delivery systems, of satellite broadcasting. What do these technological changes mean? Is this a fad? A blip on the historical chart? or a revolution?

To understand it, I turn to the tools that my education provided me, which include historical perspective and analysis, comparisons. If one can make reasonably accurate predictions during a period of rapid change, then one is in a position to navigate, to be in control of one's future.

So I jump back to the year 1475, about 25 years after the first printing press was operated, and I ask myself, "What would I have predicted, then, that came true?"

I would have predicted (had I had the wisdom then that we have now) that...

1. The printing press would open up popular access to information in general;
2. That it would bring a new art form, called the novel;
3. It would bring a new communication system called the press;
4. It would bring access to original religious sources, including the Scriptures;
5. Which in turn would create a challenge to the authority of Rome whose hold over religious infor-

mation would no longer be exclusive, and which would lead to the Reformation;

6. that it would create an appetite for information that would cause schools to be invented so that people could learn to read the information; and finally
7. Those schools would make possible an educated citizenry, which in turn would make a democracy possible.

Democracies do not thrive without an educated citizenry. With schools, a free press, and a reading public, governments - I would have predicted - would need to respond to public opinion that was educated and informed.

The printing press then was indeed revolutionary - not just technologically - but it was revolutionary in its social implications, in its educational implications, and in its political implications.

If we turn to 1985, let me try to imagine the implications of these new technologies, using the historical parallel of the printing press. So I ask, (1) "How are the technologies changing our lives?" and (2) "What is <u>likely</u> to happen?"

(1) We know that computers are entering all parts of our lives. In education, we have moved from one computer for approximately 400 children to one computer for 72 across the country; and in New York State, about one for every 17½

children - a remarkable accomplishment. There is a computer in about one out of eleven households. There are somewhere between 15 and 20 million video cassette records (or VCR's) in U.S. homes. Television (which is also part of this technological revolution) now reaches 2½ billion people in 162 countries. That's 2½ billion people, which, by any standard, is a large educational system. Music video can be seen 24 hours a day on two cable channels, and according to some, its imagery is the most avant-garde of any medium, increasing everyone's visual sophistication. The compact disk is here now for those of you who enjoy classical music; and we are told, will be here for all of us within 5 year. The compact disk will give us information storage of an incredible amount, to include text, sound, music, still pictures, moving pictures, and graphics. We will turn to any part of the record we want for any kind of information, and in any form that we wish.

Robotics has arrived. Industry people talk about products which will contain only 2% labor. I read about General Motors' "Saturn" car which will be built almost exclusively with non-human hands.

There is something coming down the pike called "ISDN" which stands for Integrated Systems Data Network, which is the opticals fiber network we have all been reading about. It will come into our home through a redesigned unit which will contain a phone, yes, but also a monitor and a computer. When this network is in place (which experts tell me

will happen within 10 years because it is now economically viable), we will be able to receive voice transmission; video disc with moving and still images; graphics which will be computer controlled; data of any kind, on the screen or in hard print copy; text - which we can read or download; and all of this will be under the user's control. It will be possible, for example, for a user to put on the screen, his or her image of an idea; to transmit that image to a receiving person, who will then change the image and send it back to the first person, so we will be having - I think for the first time in human history - a communication in user driven imagery in order to communicate ideas and concepts.

And what is happening to school-age people in the middle of all this? Well, they certainly watch MTV and we all know they listen to tapes and they watch television about 4½ hours a day. They listen to the radio and love to have access to a VCR for movies. Any time that is left over in that day is spent in listening to teachers at school, listening to their peers, using the telephone, and possible reading from text. What I am saying is that young people today are electronic learners. I would wager that they spend far more time learning from electronic sources than they do either from teachers or from print, or even both combined.

(2) What is likely to happen? How in the world do we set about educating young people for the world that is com-

ing? We have to ask ourselves, "What is an educated young person in 1985 or in 1995?" That young person, boy or girl, in third grade today, will be using a compact disk (for information storage and retrieval) by the time he or she is in 10th grade. Third graders today can be expected to be using an optical fiber network about the time they graduate from high school. They will be using a computer at work and at home. They will be on a computer network for electronic mail at work, and _____ at home. They will be receiving information from all of these electronic sources and will be drowning in "infoglut." They will be assaulted by imagery from their television sets, from their monitors, and from communication networks.

What are schools to do in the face of such enormous change? It seems to me that there are two inadequate responses that some schools make.

1. Some schools respond by saying: "This will go away, it is merely a fad; anyone can see that software isn't selling and computers aren't selling the way they were. So, if we stand very still and don't make any noise, it will all pass over."

2. There are schools who don't think it is going to go away but who respond by changing the system as little as possible. They remind me of Larry Cremins' statement that, "schools respond to revolution by inventing a course in it." Those who wish to respond the least, tend to ck technology in and around the curriculum - shoe-horning it in here

and there, with a little computer literacy, maybe some programming, a bit of word processing, and a short unit on the history of technology somewhere.

The basic assumption of this second group is that we need to fit technology into the existing curriculum, a point of view that I would question. Why do I question it? Because I don't think that technology is going to go away. I do not think it is going to be contained in little boxes around the edges of curriculum.

These technologies will revolutionize the curriculum. Why do I think that the technologies will revolutionize the curriculum? First of all, because I have an historical perspective that tells me what happened with the printing press. The printing press drove the curriculum, in the sense that learning to read print was the central subject.

Another reason that I think technology will change entirely what we do in the schools, is its nature - the nature of the electronic learning revolution. This is not a revolution of desk-top computers and keyboarding. This is not a revolution of programming languages. It is far, far, deeper than that.

Information in the new technologies is a very different matter than information in text. Information today is fluid, and rapidly changing. It is not a printed book that is set in type for years. Information delivered by tech-

nology can be in print, but its nature is to be immediate, changing, and dynamic. Our concept of information itself must be redefined.

The technologies provide us with a new way of conceptualizing a question and its answer. The technologies offer us a tool for mind extension, far different than what we have experienced from print. It is a new tool for learning. I contend that learning from electronic sources is a very different way of learning than learning from print. It is highly interactive, it is under the user's control, it is full of imagery. Among the radical changes that the new technologies are bringing is a new language. That language is imagery. Imagery is the language of the information age. We are learning to conceptualize ideas and to communicate them through images, not through text. Imagery has its own attributes, but these are different from print. It does not move left to right; it does not move in the format dictated by a printing press. Its format is fluid and free, responsive to the user.

Given a deeper understanding of the revolution we are experiencing, what could and should schools do to play a significant role, one that is appropriate to education?

My first suggestion is that we choose a role for education that is uniquely educational, not a role that is an imitation of something else, such as an office or a factory. Education is a unique institution, and it will do best if it does not try to imitate other institutions. Furthermore,

I am not persuaded that business management is a good role model for the schools. I read in Business Week, for example, that our high-tech industry is now suffering a trade deficit that will reach $12 billion this year, mostly to Japan, and not just because of the dollar. Business leaders have made some poor decisions and have failed to anticipate the future, and we are now paying a price for it. The school is a unique institution in its own right; it is not an imitation anything. While American business is failing to compete and is losing its markets overseas, the American educational system is, by far, the most educating system the world has ever known. It is not said often enough, so I am going to say it twice: We, here in the United States, are the most educated society the world has ever known. We are the most educated society the world has ever known. In my view, that is the other radical change taking place in our society along with the technologies.

In the 1960's, for the first time in the history of man, there were more students in our society than farmers. Had we understood that, perhaps we would have understood why we had a student's rebellion and not a Shay's rebellion in the 1960's. We educate more of our young people to higher levels of education than anyone, including Japan. Now we can argue about how well we do parts of that job, but let us never forget, we do more educating than any society in the history of the world. Everywhere I go around the world, our access to education is the envy and the dream of all young

people.

Education is the great success story of our society, far more so, to my mind, than its business sector. Perhaps the business world should take its lessons from education.

Education, then, should seek a role that is uniquely educational for itself. And that means redefining, "What is an educated person in the 1990's?" What will they need to know? What will they need to be able to do? How will they keep perspective amid so much change? How can we educate them to use the information technologies in an intelligent and in a caring way?

Let me use historical parallels once more. The basic skill needed after the invention of the printing press was to learn to read. The basic skills of the information age are going to include, at least two skills, possibly more. The first is the ability to evaluate the quality of information. We will be drowning, if we aren't already, in information coming to us by phone, by computer, by optical fiber, by television, by satellite. How are we going to tell what is high quality information from trash information? We will be suffering from infoglut. The schools need to teach students how to evaluate the quality of that information. Are we going to believe that the most recent information is the best? This a tendency with technologies, to think that the most recent thing that comes up on the screen is the best. We need, desperately, to develop a

curriculum to evaluate the quality of information we deal with, not just its quantity. We need intelligent consumers of information, people who can discriminate among those pieces of information that are relevant, that are valid, that are reliable, that are accurate, and that deal with the significance of the event. This information will come, not just in print and probably least in print, but will come over screens or monitors and will be high in imagery.

This leads me to the second basic skill of the information age which is the ability to comprehend imagery as the language of the information age. We need to educate people to decode images and to comprehend them. Young people are sophisticated in their exposure to electronic imagery, far more so than people of our ages. What they need is to be educated in a rigorous approach to images that includes analysis, in identifying the processes and techniques of imagery that communicate an attitude, a mood, a predisposition to act. Just as words can be understood first by learning how to decode letters, and second, to comprehend the meaning of passages, so young people need to be taught how to decode single images; what they are made of; and how each adds to the total impact. Then they need to know how to comprehend a series of images on film, or on tape, or on a computer monitor, so they can identify the intended message, how it was constructed, and how to compose in imagery themselves.

I would argue that one cannot make an informed judge-

ment today, in 1985, without understanding imagery. I would point to the last election, which all the media told us was based on imagery, and I think it was, and say that an informed citizen today has to understand imagery.

If we take an educated view of the future, as we did of the past and present, we then will recognize the radical nature of the new information technologies. Certainly they are as radical in their implication and impact on society as was the printing press; and in terms of that frame of reference, it seems to me we can then begin to think imaginatively how schools need to respond. Schools, I believe, must make the information age instrumental in the curriculum. Schools need to reconceptualize themselves as an institution, one that is performing quite different functions than before, and one that is being transformed by the information technologies. If schools do not reconceptualize themselves, I am afraid they are going to lose their position as the major educator. I see the technologies moving into museums, into libraries, into shopping centers, into offices, and I can see the possibility of education moving along those optical fiber networks into places other than the schools. The schools will soon be faced with children coming from day-care centers who have been educated on the technologies before they are four. That push will come from below. The push that will come from above will be coming from the universities who now are wiring up - one computer per student, one computer per faculty. We are seeing, and

will see, innovative uses of the technologies for teaching and learning and this will come from the top down. The public schools will be pressed from below; the public schools will be pressed from above; and before they are pressed, they should think about what they could be doing as an educational institution to make the information age central to their function.

What they need to do in short, is to educate as though the technological revolution is the most important change in learning since the 16th century - because that is what it is.